The years of the nineteenth century having A for their Dominical Letter were: 1809, 1815, 1820, 1826, 1837, 1843, 1848, 1854, 1865, 1871, 1876, 1882, 1893, the Epacts for which are 14, 20, 15, 22, 23, 0, 25, 1, 3, 9, 4, 11, 12.

Of these the years admissible must have the Epacts 24, 25, 26, 27, one only meeting the conditions, viz., 1848.

Also solved by J. Scheffer, and A. H. Holmes.

236. Proposed by L. SHIVELY, Mt. Morris College, Mt. Morris, Ill.

Sum to infinity the series $\frac{n^2}{(n+1)!}$ beginning with $n=1$.

Solution by L. E. NEWCOMB, Los Gatos, Cal.

The general term $\frac{n^2}{(n+1)!}=n\left(\frac{1}{n!}-\frac{1}{(n+1)!}\right)$. Set $n=1, 2, 3, \ldots\ldots$ in succession, and the series becomes

$$1-\frac{1}{2}+\frac{2}{2!}-\frac{2}{3!}+\frac{3}{3!}-\frac{3}{4!}\ldots\ldots\ldots=1+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+\ldots\ldots\ldots=e-1.$$

Also solved by G. W. Greenwood, J. Scheffer, and the Proposer.

AVERAGE AND PROBABILITY.

162. Proposed by F. P. MATZ, Ph. D., Sc. D., Reading, Pa.

Two points are taken at random in the surface of a circle and a chord is drawn through them. Find the average area of the segment containing the center of the circle.

Solution by the PROPOSER.

Let 2θ=the sectoral angle, then the area of the segment in question is $U=\frac{1}{2}(2\pi-2\theta+\frac{1}{2}\sin 2\theta)r^2$.

$$\therefore A=\frac{r^2}{\pi}\int_0^{\frac{1}{2}\pi}Ud\theta=\tfrac{1}{2}\left(\frac{3}{2}\pi+\frac{1}{\pi}\right)r^2.$$

CALCULUS.

199. Proposed by F. P. MATZ. Sc. D., Ph. D., Reading, Pa.

If the perimeter of an ellipse varies uniformly at the rate of $\frac{1}{4}$ inch per unit of time, at what rate is the eccentricity varying the instant the perimeter becomes 60 inches and the major axis 25 inches?

No correct solution for this problem has been received.

200. Proposed by R. D. CARMICHAEL, Hartselle, Alabama.

Find the equation of a curve so that the area bounded by the curve, the axis of x, and any ordinate y, is equal to $y-x$, x being the *corresponding* abscissa.

Solution by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va.

$$\int_0^x ydx=y-x. \quad \therefore ydx=dy-dx, \text{ or } dx=\frac{dy}{y+1}.$$

$x=\log(y+1)$, and $e^x=(y+1)$ is the required equation.

Also solved by S. A. Corey, F. P. Matz, and the Proposer.

DIOPHANTINE ANALYSIS.

127. Proposed by F. P. MATZ, Sc. D., Ph. D., Reading, Pa.

Can there be determined three cube numbers whose sum is the product of two squares?

I. Solution by A. H. HOLMES, Brunswick, Maine.

Take x^3, x^3y^3, and x^3z^3, for the three cube numbers, and u^2 and v^2 for the square numbers.

$\therefore x^3(1+y^3+z^3)=u^2v^2$. If we put $y=2$, $z=3$, $1+2^3+3^3=6^2=u^2$, $x^3=v^2=w^6$. $\therefore x=w^2$, $v=w^3$. Put $w=2$. $\therefore x=4$, $v=8$.

$\therefore 64+512+1728=36\times64=2304$, or $4^3+8^3+12^3=6^2\times8^2$.

If it is required that no two of the numbers to be cubed and squared should be the same, put $x^3=uv$, so that $1+y^3+z^3=uv$.

Put $x=9$, $y=6$, and $z=8$. Then $u=3$, $v=243$.

$\therefore 9^3+54^3+72^3=3^2\times243^2$.

II. Solution by J. EDWARD SANDERS, Hackney, Ohio.

If $a^3+b^3+c^3=d^3=(e.f)^3$, then one set of numbers satisfying the condition is: $(a.d^{2n-1})^3+(b.d^{2n-1})^3+(c.d^{2n-1})^3=d^{6n}=(e^{3n})^2.(f^{3n})^2$.

Again, since $1^3+2^3+3^3=2^2.3^2$, another solution is $(a^4)^3+(2a^4)^3+(3a^4)^3=(2a^3)^2.(3a^3)^2$.

Also solved by G. B. M. Zerr, R. D. Carmichael, and the Proposer.

GEOMETRY.

NOTE. Problems 259 and 261 are identical. A solution may be found in Lachlan's *Modern Pure Geometry*, pp. 241-2.

254. Proposed by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud, England.

Find the cartesian equation of a line that is both tangent and normal to the cardioid.

Solution by F. H. SAFFORD, Ph. D., The University of Pennsylvania.

Let the required line be $2ax+2by+c=0$, which is to be both tangent and normal to $(x^2+y^2+cx)^2=c^2(x^2+y^2)$.

The constants a and b are to be found so as to satisfy the given conditions.

Transform the line and cardioid through the inversion